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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/520,472	04/07/2005	Stefan Holler	5083-47PUS	6529
27799 7590 09/01/2009 COHEN, PONTANI, LIEBERMAN & PAVANE LLP 551 FIFTH AVENUE SUITE 1210 NEW YORK, NY 10176				
EXAMINER				
ENIN-OKUT, EDUE				
ART UNIT		PAPER NUMBER		
1795				
MAIL DATE		DELIVERY MODE		
09/01/2009		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/520,472

Applicant(s)

HOLLER ET AL.

Examiner

Edu E. Enin-Okut

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 7-9-2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) 1-11 and 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-29, 31-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date: _____

**FUEL CELL STACK COMPRISING A COUNTERFLOW COOLING SYSTEM
AND A PLURALITY OF COOLANT-COLLECTING DUCTS
LOCATED PARALLEL TO THE AXIS OF THE STACK**

Detailed Action

1. The amendments filed on July 9, 2009 were received. Applicant has amended claims 12, 31 and 32; cancelled claim 30; and added claims 34 and 35. Currently, claims 12-29 and 31-35 are pending.
2. Applicant's request for reconsideration of the finality of the rejection of the last Office action (issued on April 9, 2009) is persuasive and, therefore, the finality of that action is withdrawn.
3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

4. Claims 12-18, 20, 22, 23, 28, 29, 31-33 and 35 are rejected under 35 U.S.C. 102 (b) as being anticipated by Vitale et al. (US 6,066,408). (The rejection of claim 30 under 35 U.S.C. 102 (b) as being anticipated by Vitale et al. is withdrawn because claim 30 was cancelled.)

Regarding claims 12, 28, 29, 31, 32, 33 and 35, Vitale teaches a proton exchange membrane fuel cell stack including a membrane electrode assembly with a coolant-humidifier plate 202 (having a plurality of channels) between adjacent membrane electrode assemblies (Figs. 2A, 2B, 2C, 3, 6). The channels have a serpentine configuration (a direction of flow of one of the channels is opposite to a direction of flow of an adjacent channel) (Figs. 3, 6). Each channel has two open ends (Figs. 2A, 2B, 2C, 3, 6). The two open ends, formed on two different sides of the fuel cell, serving as an inlet and outlet (alternate between inflow and outflow) (Figs. 2A, 2B, 2C, 3, 6; 7:8-20).

Although Vitale does not expressly describe an axis for the fuel cell stack, one would appreciate that the axis is based upon the plane of reference. Therefore, it can be concluded that the fuel cell stack is stacked along the x-axis and the cooling channels shown in Figs. 2A, 2B, 2C, 3 and 6 extend transversely to the stack axis in the z-axis direction.

Regarding claim 13, Vitale teaches an inlet and outlet for channels of the said fuel cell stack. The inlet and outlet for channels are arranged one above another in a stack formation aligning the fuel cell stack manifolds. While the examiner recognizes that the reference does not recite common conductor collector per se, it is the perception of the examiner that, since the said fuel cell cooling plates include manifold inlets and outlets, it necessarily means that the manifolds operate as common conductor collectors. See Figs. 2A, 2B, 6; and, 7:8-20.

Regarding claim 14, Vitale teaches of a plurality of manifolds, as stated in the above paragraph to be common collector channels, are arranged in parallel on two sides of the fuel cell stack that allow for the inlet and outlet channels to communicate by aligning the holes in the various fuel cell plates. See Figs. 2A, 2B, 6; and, 7:8-20.

Regarding claim 15, Vitale teaches a fuel cell stack cooling channels are utilized exclusively for cooling said fuel cell (Fig. 6; 9:15-20).

Regarding claims 16 and 17, Vitale teaches a fuel cell stack wherein electrode assemblies includes an anode and a cathode where the channels are open toward the electrodes and conduct a reactant supply toward aside anode electrodes (Figs. 2A, 2B, 2C).

Regarding claims 18 and 24, Vitale teaches a channel width of 0.1 to 1 inch (i.e., 2.54 to 25.4 mm) (7:54-56).

Regarding claim 20, Vitale teaches an open end exhaust channel (244, 262, 268, 272) (common collector channel) (Fig. 2C).

Regarding claim 23, Vitale teaches a square fuel cell stack that has an axis through the center of stack that is parallel to the common collector channel (Figs. 2C, 6).

Claim Rejections - 35 USC § 103

5. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vitale et al. as applied to claims 12-18, 20, 22, 23, 28, 29, 31-33 and 35 above.

Vitale is applied and incorporated herein for the reasons above.

Regarding claim 34, Vitale does not expressly teach that the channels are rectilinear. However, since such a modification would have involved a mere change in the shape of a component, it would have been an obvious matter of design choice to form the channels of Vitale with a rectilinear shape because a change in shape is generally recognized as being within the level of ordinary skill in the art. *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See MPEP 2144.04 (IV).

6. Claims 24 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vitale et al. as applied to claims 12-18, 20, 22, 23, 28, 29 and 31-35 above, and further in view of Koschany (US 2003/0012986).

Vitale is applied and incorporated herein for the reasons above.

Regarding claims 22 and 26, Vitale does not expressly teach that coolant is supplied with an pressure of 0.1 to 10 bar. However, Koschany teaches that an air cooled fuel cell stack comprises cooling channels with a width of 1.0 mm (para. 29, 30). The 1.0 mm width cooling channels allows for the dispersion of oxygen. Thus, it would be obvious to one of ordinary skill in the art at the time of the invention to utilize the 1.0 mm width channels with the fuel cell stack of Vitale because Koschany teaches coolant channels of this width evenly distribute of oxygen to sufficiently cool a cathode structure.

Further, Koschany recognizes that the pressure of the cooling channel is determined by the size and power output of each fuel cell stack (see para. 154). Therefore, it would have been within the skill of the ordinary artisan at the time of the invention to adjust the size and power output of the fuel cell stack to reach a pressure of 0.1 to 10 bar. It has been held that the discovery of the optimum value of a result effective variable in known process is ordinarily within skill of art. *In re Boesch*, CCPA 1980, 617 F.2d 272, 205 USPQ 215.

7. Claims 19 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vitale et al. as applied to claims 12-18, 20, 22, 23, 24, 26, 28, 29 and 31-35 above, and further in view of Shelekhin et al. (US 5,972,530).

Vitale is applied and incorporated herein for the reasons above.

Regarding claims 19 and 25, Vitale teaches a fuel cell stack including cooling channels; however, Vitale does not expressly teach that the cooling channels have a length in the range of 20 mm to 200 mm.

Shelekhin teaches an air cooled fuel cell stack having cathode and anode fluid flow plates with a height of 10 to 750 mm (3:53-55). It is the position of the examiner that the cooling channel must be equal to the cathode and anode fluid flow plates to adequately fit the construction of the fuel cell stack. Therefore, it would be obvious to one ordinary skill in the art to utilize the height requirements of Shelekhin with the fuel cell stack of Vitale because Shelekhin teaches the height is dependent on the power requirements and space available of the fuel cell stack.

8. Claims 21 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vitale et al. as applied to claims 12-20, 22-26, 28, 29 and 31-35 above, and further in view of Nelson (US 6,689,500).

Vitale is applied and incorporated herein for the reasons above.

Regarding claim 21, Vitale discloses a fuel cell stack; however, a sealing edge surrounding a bipolar plate is not expressly taught.

Nelson teaches the fuel cell stack has a gasket that seals the edge surrounding a bipolar plate of said fuel cell. The bipolar plate with the sealing edges is arranged between adjacent fuel cells, with the common collector channel being formed by recesses in said sealing gaskets (Fig. 1). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the sealing gaskets with the bipolar plate of Vitale because Nelson teaches the gaskets keep gases from leaking from the manifolds (see Nelson, 5:65-67).

Regarding claim 27, Vitale teaches a fuel cell stack; however, an enclosure along an edge of a fuel cell is not expressly taught. However, Nelson also teaches that the fuel cell stack with a common collector channel is formed by an enclosure along an edge of said fuel cell (Fig. 1). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to utilize a common collector along the edge of the fuel cell of Vitale because Nelson teaches directs the humidified air from the coolant outlet manifold to the cathode intake manifold for utilization in the fuel cell (see Nelson, 6:1-10).

Response to Arguments

7. Applicant's arguments filed July 9, 2009 have been fully considered but they are not persuasive.
8. As to the applicant's argument with respect to Vitale et al. reference and the amendment to claim 12 (i.e., "... said channels ... having two open ends on different sides of said fuel cell"), Vitale teaches two open ends on different sides of the cell as shown in Fig. 2C as discussed in the rejection of amended claim 12 above.

9. As to the remainder of applicant's arguments with respect to claims 12-29 and 31-35, they have been considered but applicant has amended the claims such that new grounds of rejection were necessitated as presented above.

Conclusion

10. The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Shioda (JP 01-302670 A) discloses a fuel cell stack where the gas supplied to the cells gases A and B flow in opposite directions (Abstract; Fig. 3, 4). Rock (US 6,099,984) teaches a PEM fuel cell with mirrored serpentine flow channels (Abstract; Fig. 3). Zeng (US 6,461,754) teaches solid polymer fuel cell have a coolant circulation circuit traversing the face of the coolant flow field plate in a serpentine fashion (Abstract; 3:44-63; Figs. 1-4).

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Edu E. Enin-Okut** whose telephone number is **571-270-3075**. The examiner can normally be reached on Monday to Thursday, 7 a.m. - 3 p.m. (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edu E. Enin-Okut/
Examiner, Art Unit 1795

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1795